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Structure of pancreas in *Palam Dove* (Streptoplia selegalensis)

Zohreh Saadatfar[1]*, Marziyeh Asadian[2] , Elias Alishahi[2]

*[1]*Department of Basic Sciences, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran*

[2] *Graduated student, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran*

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Abstract

The purpose of this study was to have a general view of pancreas in one species of pigeon. Some disorders affect avian pancreas.Pancreatitis and Pancreatic degeneration have been described in many infections and deficiencies. In pigeon, lymphoid infiltration and necrosis diffusion is a common finding. After anesthesia, tissue pieces were dissected from the lobes. Samples were fixed in Bouin, processed and stained by H&E and Gomori for light microscopy study. The pancreas of this pigeon had four lobes. The acini had oval shape with centroacinar cell. Ducts had simple to stratified cuboidal epithelium and muscular layers were around of ducts.Isletsare more numerous in ventral part of lobe B and in dorsal part of lobe A.The spleen segment in this pigeon contained fewer islets than the rest of the pancreas.The cells of islets in this species of pigeon were not distributed evenly throughout each islet.There were B cell and a few D cells inside light B islets andthere were A cell and a few D cells inside dark A islets.There were some similarities and differences in pancreas of this species to other birds.

Keywords: histology, pancreas, pigeon (*Palam Dove)*

*Corresponding author: Zohreh Saadatfar
Email: saadatfar.z@gmail.com
Tel: + 98 511 880 5622
Fax: + 98 511 8763852

Introduction

In most animal species, pancreas is an important gland with an exocrine region which releases digestive enzymesand an endocrine part which have three or four cell types, producing regulatory hormones. Most of the studies havebeem done on the pancreas of rat (Ebong *et al*., 2008) but there hass been few researches on avian pancreas. The avian pancreas is generally composed of two lobes, but many reports indicated that it had four lobes: dorsal, ventral, splenic and third (Mikami and Ono, 1962; Tarakci *et al*., 2005). Dorsal and ventral lobe extend in duodenal loop from apex to distal duodenum. Splenic lobe extends from the head of pancreas towards the spleen.Mikami and Ono state that the third lobe of chicken pancreas is a part of the ventral lobe so it divides into ventral lobe properly and third lobe on the basis of independent form of the latter, but in some other studies dorsal lobe is divided to the additional third lobe. The exocrine pancreas is formed by acinar cells and excretory ducts with small and large diameter. The cytoplasm of the acinar cells is richer in the secretory zymogene granules (Motta *et al*., 1997). In birds, the main excretory ducts consist of the dorsal and ventral pancreatic ducts (Bock *et al*., 1997). Moreover, some avian species have an additional third duct.

The endocrine parts of the avian pancreas are scattered singly or in small groups in various shapes and sizesin the interstitial section of the exocrine part. They can be observed as two types of islets, the dark A islet and the light B islets.

There are some differences in structure of avian pancreas. Division of lobes, Distribution of the islets in lobes, the form and frequency of endocrine cells in islets and some special features in structure of ducts are the most important differences. Thereare also some diseases affecting avian pancreas, acute pancreatitis or necrosis; and chronic pancreatitis, resulting in pancreatic fibrosis and exocrine insufficiency.Pancreatic degeneration also has been described in infections with avian influenza virus (Amann *et al*., 2006).Many investigations have been done on the effects of food restriction and different energy and protein contents of the diet on ghrelin gene expression in broiler chicken (Ghazanfari *et al*., 2010), so studies also can be done on gene expression on endocrine cells of pancreas.

The aim of this study is a general view of pancreasin one species of pigeon (*Palam Dove)* by light microscopic examination.

Materials and methods

In this study 5 adult pigeons were used. After anesthesia of the birds, they were sacrificed. Tissue pieces were dissected from the lobes of pancreas. Then samples were fixed in Bouin solution and processed for embedding in paraffin. Tissue blocks were cut by a microtome into 6 μm sections. The sections were stained using Hematoxyline and eosin for general observation and Gomorri's method for pancreatic islet cells.

Results

The pancreas of *Palam Dove* (StreptopeliaSenegalensis) is located between two arms of duodenal loop and has 4 lobes: dorsal, ventral, third and splenic lobes (Fig.1, 2). The exocrine parts are composed of acini and ducts. The acini have oval shapes with large granules and centroacinar cells (Fig.3). Their ducts are in different sizes with simple to stratified cuboidal epitheliums. The interlobular ducts are surrounded by circularly arranged muscle fibers. The main and large ducts are composed of three layers, the mucosa, circularly arranged muscle fibers and external connective tissues. The endocrine parts of pancreas are scattered between exocrine part and they appears singly or as islets of various shapes and sizes.

Ventral lobe is approximately 5 cm long, 0.1-0.6 cm wide. In this lobe, islets are in different sizes and there are small groups of cells. B islets have regular pale like structures, distinctly separated from exocrine part and are less densely populated than A islets (Fig.4). By a general view it seems that they are more and smaller than

A islets in ventral lobe. There are B cells and a few D cells inside B islets. B cells are distributed around of B islets and their granules are never stained as intensely as the granules of the A cells of dark islets.Some of exocrine cells are arranged in a circular pattern around the islets.



Figure 1. Pigeon pancreas. Pancreas is attached to the duodenal loop. V- Ventral lobe(X40)

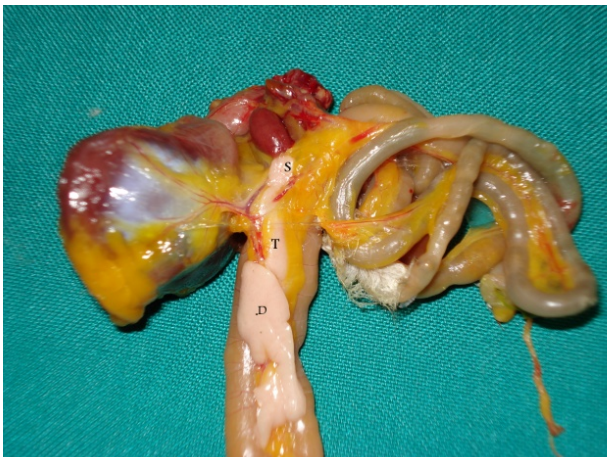


Figure 2. Pigeon pancreas in duodenal loop. D-Dorsal lobe; T-Third lobe; S-Splenic lobe (X40)

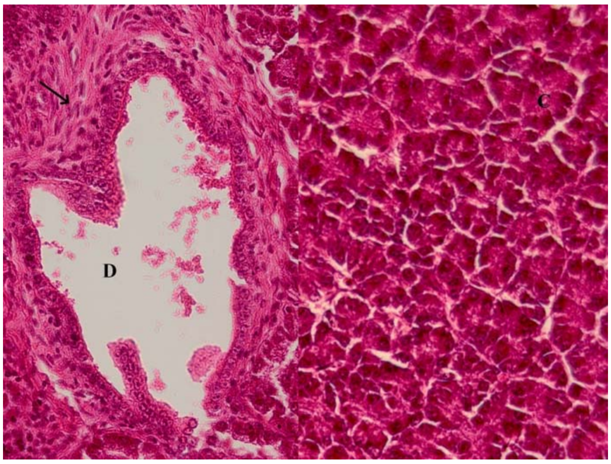


Figure 3. Pigeon pancreas. Interlobular duct (D). Muscular fibers (m) surround the ducts (arrows). Centroacinar cells (C). (H&E). (X200)

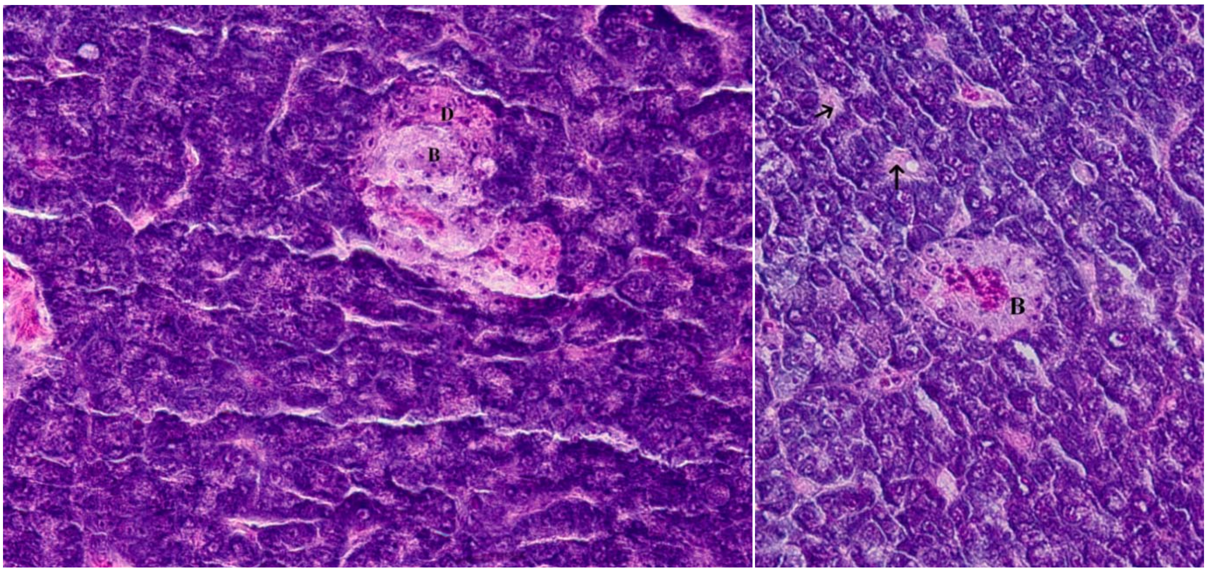


Figure 4. Light, B islets (B). B cells (B) and D cells (D). B cells distributed among exocrine acinuses (arrows).Gomori's staining (X400) ,(X200)

Dorsal lobe is divided into two distinct segments; dorsal lobe proper is 6cm long and 0.3-0.4 cm wide, third lobe is 3.5cm long and 0.4-0.5cm wide. In dorsal and third lobe, the dark A islets with different sizes have more irregular shapes and they are more densely populated than light B islets and it appears to occupy mostly around of the lobe. The dark A islets are almost always larger than light B islets and it seems that the volumes of them are more than light islets (Fig.5,6). The irregular outline appears to contain cords of exocrine cells or it seems to have several branches. There are A cell and a few D cells inside dark A islets. A cells are distributed throughout these islets.

The spleen segment in this species of pigeon contains a few islets attached to other lobes. The most islets in this part resembles the A islets. It seems that spleen segment in Palam Dove have not been attached to other segments.

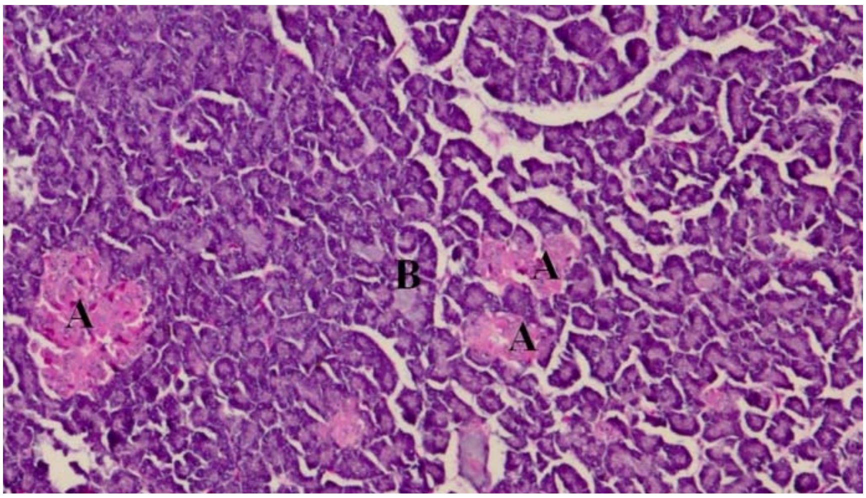


Figure 5. dark, A islets (A) in different sizes and small groups with irregular shapes. B cells also are distributed among exocrine acinus (B). Gomori's staining (X100)

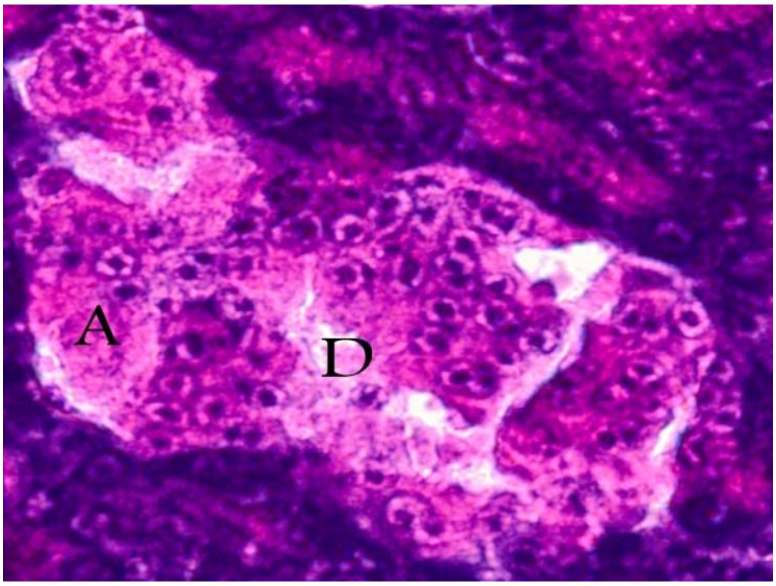


Figure 6. dark, A islets (A) with irregular shapes. A cells and D cells.Gomori's staining (X1000)

Discussion

The pancreas of the adult birds is generally divided into dorsal and ventral lobes, but in mammalian pancreas, dorsal and ventral buds coalesce during development. In addition, the bird pancreas usually contains the spleen and third lobes. The pancreas of Palam Dove has dorsal, ventral, third and splenic lobes. Its resemblance is in the remnant of dorsal lobe but they separate by a membrane sheet of connective tissue. The spleen segment has no point of attachment. In previous studies has been stated that the attachment of this segment varies in bird species. It may be attached to the dorsal lobe or ventral lobe only but in others, it may be attached to both lobes. In some instances it has no point of attachment (Machio *et al*., 1966).The exocrine cells are granulated acinus cells, which are arranged also as circular cap shapes with different thicknesses around the light islets, this structures also has been reported in the duck pancreas (McLeishandEglitis,1969). Centroacinar cells are in central lumen of acinuses, they have euchromatic nuclei towards the lumina of acini and produces fluid rich in sodium andbicarbonate.

This cell has been showed in some species (Glumez, 2003), but it is not clearly observed in mammals.The structure of the ducts in this species is similar to that in previous studies, and circular muscle fibers are around the ducts.

It is found that the islets in this species of pigeon are not distributed evenly throughout each lobe. The islets are concentrated in central area of ventral lobe and they are concentrated around of dorsal lobe. The spleen segment in this pigeon contains fewer islets than the rest of pancreas. In some studies there were more islets in this area. The endocrine pancreas of the Coturnix quail consists of two major islet configurations.B Islets are found in all four lobes of the pancreas, but A islets are only in the third and splenic lobes. Pancreatic islets comprise only a small percentage of the tissue volume in the ventral, dorsal and third lobes. In the splenic lobe, however, the islets constitute more than 50% of the total cellular mass (Phillip, 2005).the islets of the dorsal pancreatic lobe of the bustard contain all of the peptidergic hormones normally present in the islets of other avian species, but are not segregated into dark A and light B cells(Mensha *et al*., 2000)

In the spleen segment of the chicken, both A and B islets are more in the spleen segment.In the white leghorn cockerel, the islets are restricted to third and splenic lobes (Mikami and Ono, 1962). The B islets are small and large groups of B cells and a few D cells, the large islets resemble human islets in shape and staining. They have a regular outline and the B cells are in the center of islets.As some other avian species,B cells are demonstrated in the center of islets (Taraky *et al*., 2007). The A islets which are larger than the others,are a darker staining group with a ragged outline which contain A cells and D cells. A cells are in peripheral region and it is as many other reports (Glumez *et al*., 2004).

D cells in this pigeon also can be observed in both A and B islts (Mikami and Ono, 1962). There is no obvious B cell in the A islets which is similar to some other birds (Glumez *et al*., 2004). In conclusion the structure of pancreas in *Palam Dove* is found to have similarities and differences in a few aspects to other birds.

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(استرپتوپلیا سلگالنزیس)

زهره سعادتفر[1*]، مرضیه اسدیان[2]، الیاس علیشاهی[2]

[1] گروه علوم پایه، دانشکده دامپزشکی، دانشگاه فردوسی مشهد، مشهد، ایران
[2] دانش آموخته ، دانشکده دامپزشکی، دانشگاه فردوسی مشهد، مشهد، ایران

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چکیده

هدف از این تحقیق بررسی کلی ساختمان پانکراس در یک گونه از کبوتر می باشد. اهمیت مطالعه پانکراس از جهت تغییراتی همچون دژنراسیون و تورم پانکراس در بیماری های عفونی و متابولیک می باشد. در این مطالعه، بعد از بیهوشی لب های مختلف اندازه گیری و نمونه برداری از آن ها انجام شد. سپس نمونه ها در محلول بوئن ثابت وپاساژ بافتی جهت مطالعه با میکروسکوپ نوری انجام شد. در کبوتر پالام داو، پانکراس دارای چهار لب می باشد. آسینی های بخش اگزوکراین بیضی شکل و حاوی سلول مرکز آسینی می باشد. مجاری از مکعبی ساده تا مطبق و حاوی فیبر های عضلانی در اطراف مجاری است. در لب شکمی جزایر B و در لب پشتی جزایر A ، اکثریت جزایر را تشکیل می دهند و توزیع سلول ها بویژه در جزایر B به نظر اتفاقی نبوده و از نظم خاصی برخوردار است. سلول های B و D در داخل جزایر روشن B و سلول های A و D در داخل جزایر تیره A مشاهده می شوند. در کل پانکراس در این گونه از کبوتر دارای شباهت ها و تفاوت هایی نسبت به پرندگان دیگر می باشد.

واژگان کلیدی: بافت شناسی، لوزالمعده، کبوتر (پالام داو)